

Renewable Energy Question 28: *Has Michigan, or have other jurisdictions, used a statewide net metering program? How have such systems handled small-scale and larger projects? What policies have been proposed or tried regarding community renewables, meter aggregation and neighborhood net metering?*

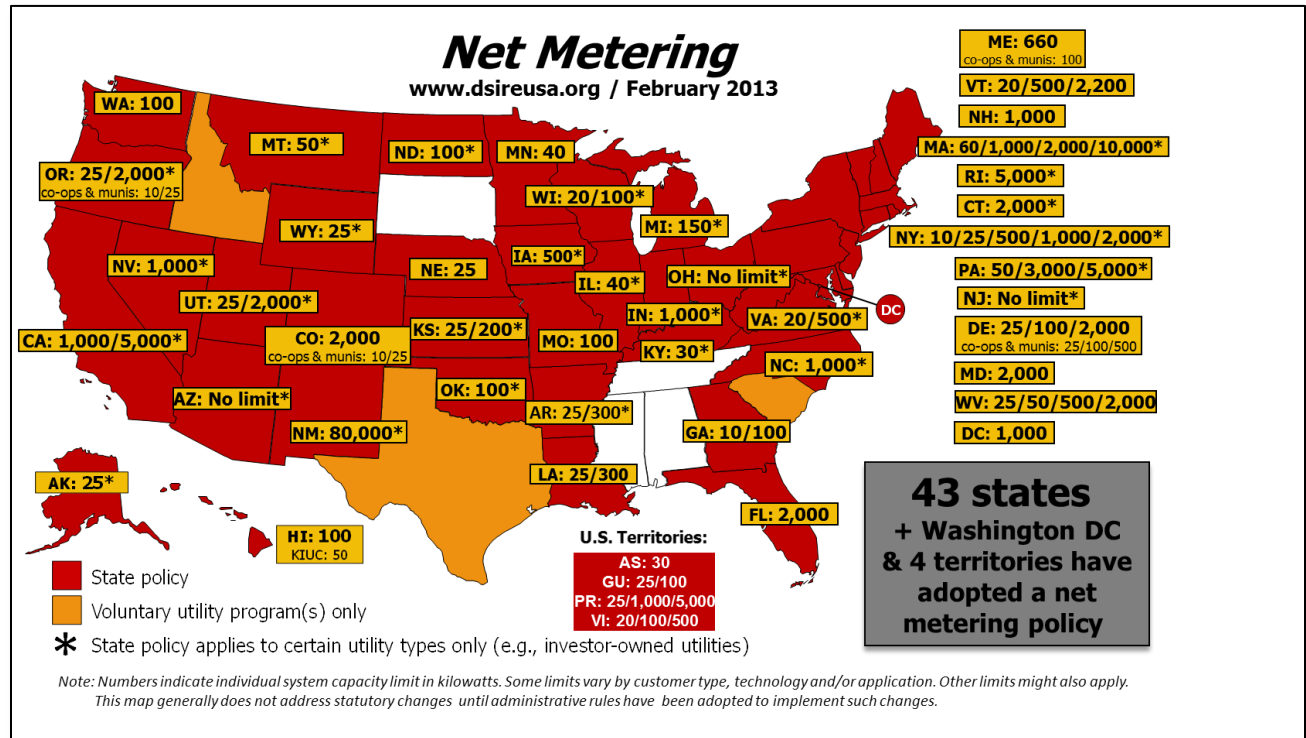
Executive Summary

1. Forty-three states, Washington D.C., and four territories have adopted a statewide net metering policy. State policies vary widely based on several key criteria, including system capacity limit and meter aggregation
2. Michigan's net metering program has encouraged the development of on-site renewable generation to offset customers' electric consumption and reduce electric bills. The system capacity limits adopted by Michigan's net metering program provide more than adequate capacity to accommodate significant growth in participation
3. However, a key concern with net metering is the transfer of electric system costs from participating to non-participating ratepayers, resulting in unfair rate subsidization. This could lead to a "death spiral" if not managed carefully
4. Studies in other states show inconclusive results about the rate impacts of net metering. The potential economic impacts would need to be rigorously studied before any changes were made to Michigan's net metering program

1. Forty-three states, Washington D.C., and four territories have adopted a statewide net metering policy. State policies vary widely based on several key criteria, including system capacity limit and meter aggregation

Net metering is a policy that allows electric customers to produce onsite electricity to offset their own electricity consumption and sell excess generation to the utility at a set price. The large majority of US states, including Michigan, have established net metering policies. The map below summarizes state net metering policies with numbers indicating individual system capacity limit in kilowatts. Individual system capacity limit defines the maximum capacity of a system that qualifies for the net metering policy. A detailed comparison of states' net metering programs is provided in Appendix I.

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Individual system capacity limits vary considerably among the states, from 20 kW in Wisconsin to 80,000 kW in New Mexico. Some states (e.g., AZ, CO, MD, NV, and RI) limit systems to a certain percentage (e.g., 125%) of the customer's load so that customers do not intentionally oversize their systems. Some states (e.g., NJ, OH) do not specify the capacity limits but require the systems be sized so that energy production primarily offsets part or all of the customer's electricity consumption. Some states (e.g., CA, CT, IN, IA, MN, NC, WA) have only one capacity limit for net metering systems while others (e.g., MA, MI, NY, PA, VA, TX) have multiple capacity limits for different technology types, ownership, or customer classes.

Besides individual system capacity limits, many states have also defined aggregate capacity limits for in-state net metering systems. The aggregate capacity limits range from 0.2% of a utility's peak load in Georgia to 5% of peak demand in California. A few states specify the aggregate capacity limit in terms of megawatts (e.g., 1,500 MW in MD).

Notably, all state net metering programs include solar as an eligible technology. In recent years, most states have extended net metering to other kinds of renewable energy systems as well. Most states that have addressed renewable energy credit (REC) ownership for net-metered

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systems have concluded that RECs belong to customers (23+ states including AZ, CO, FL, IL, and MI). And only a few states decided they belong to utilities (e.g., KS, NM, and NC).

Michigan's Net Metering Program

Michigan's net metering program, available to customers of Michigan's rate-regulated utilities, cooperatives and alternative electric suppliers (AES), applies to renewable energy systems using solar, wind, biomass, geothermal, anaerobic digester gas (i.e., animal waste), landfill gas, municipal solid waste and moving water. Utilities must provide net metering customers with electric service at nondiscriminatory rates that are identical to those that would be charged if the customer were not participating in net metering.

Net metering billing practices are split into two categories: all qualifying customer generators up to 20 kW are eligible for category 1 net metering and most systems between 20 kW and 150 kW are eligible for category 2 net metering. Methane digesters up to 550 kW are eligible for net metering, either category 1 or category 2 depending on their size. Category 1 net metering is available until the aggregate net metered capacity reaches 0.5% of a utility's peak load. Category 2 net metering is available until the aggregate net metered capacity reaches an additional 0.25% of a utility's peak load. In general, the capacity of an individual system is limited to the electricity needs at the site where the system is located.

For a category 1 system, net excess generation (NEG) during a billing period may be carried forward to the next billing period at the retail rate including the power supply component and a subsidy for the entire transmission and distribution components. Category 2 net metering (facilities up to 150 kW) allows NEG carry over at the power supply component of the retail rate each billing period. Credits associated with category 2 net metering may not be applied against distribution charges. Customers on time-of-use rates may carry forward NEG at the applicable retail rate for each time-of-using pricing period within a billing period. The legislation does not define an annual true-up or account reconciliation period, meaning the NEG can be carried forward indefinitely.

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2. Michigan's net metering program has encouraged the development of on-site renewable generation to offset customers' electric consumption and reduce electric bills. The system capacity limits adopted by Michigan's net metering program provide more than adequate capacity to accommodate significant growth in participation

As concluded in the Michigan Public Service Commission's (MPSC) Net Metering & Solar Pilot Program report¹,

"The net metering program, available to customers of Michigan's rate-regulated utilities, cooperatives and alternative electric suppliers, has encouraged the development of onsite renewable energy electric generation projects to offset some or all of a customer's electric energy needs and reduce electric bills."

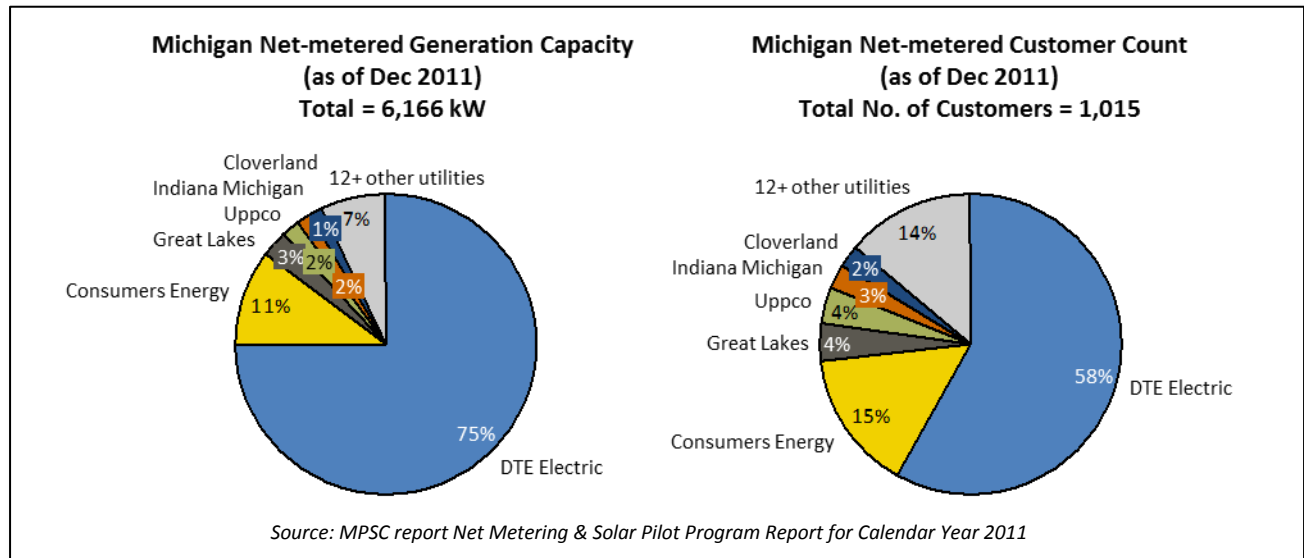
"Customer participation in the net metering program grew from 628 customers in 2010 to 1,015 customers in 2011. In addition to the milestone of surpassing 1,000 participating customers, the first modified net metering projects in the category 2 (20kW to 150 kW) size range and an alternative electric supplier net metering project were reported. At the end of 2011, the current capacity of net metering installations is approximately 6,166 kilowatts (kW). This represents a 118% increase in program size over 2010. For the last two years, Michigan experienced tremendous growth in the number of solar installations due to net metering and Detroit Edison's SolarCurrents program."

It is worth noting that about 75% of the generation capacity and 60% of the participants in Michigan's net metering programs are customers of DTE Electric as of the end of Dec 2011. (Detailed data can be found in Appendix II). Since then, DTE Electric's net metering participation has grown to 808 customers with 6,516 kW total generation capacity as of Feb 19, 2013.²

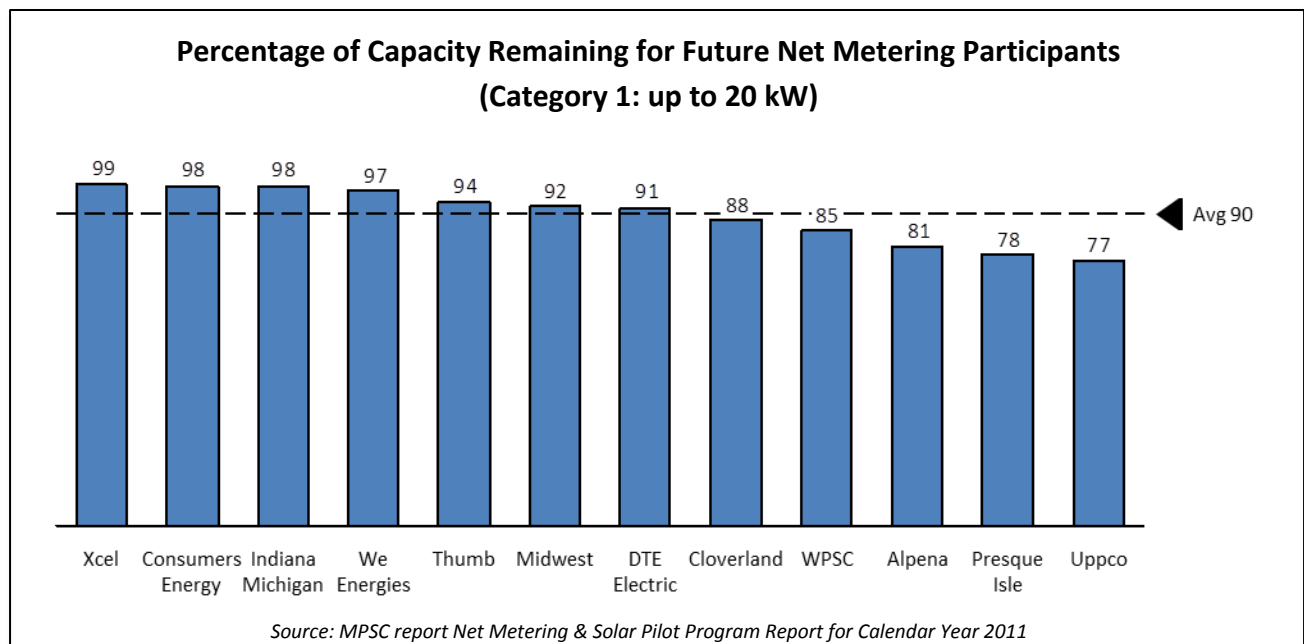
¹ Michigan Public Service Commission. (2012). Net Metering & Solar Pilot Program Report For Calendar Year 2011. http://www.michigan.gov/documents/mpsc/NetMeteringReport_Aug2012_396259_7.pdf. Accessed Feb 19, 2013.

² DTE records

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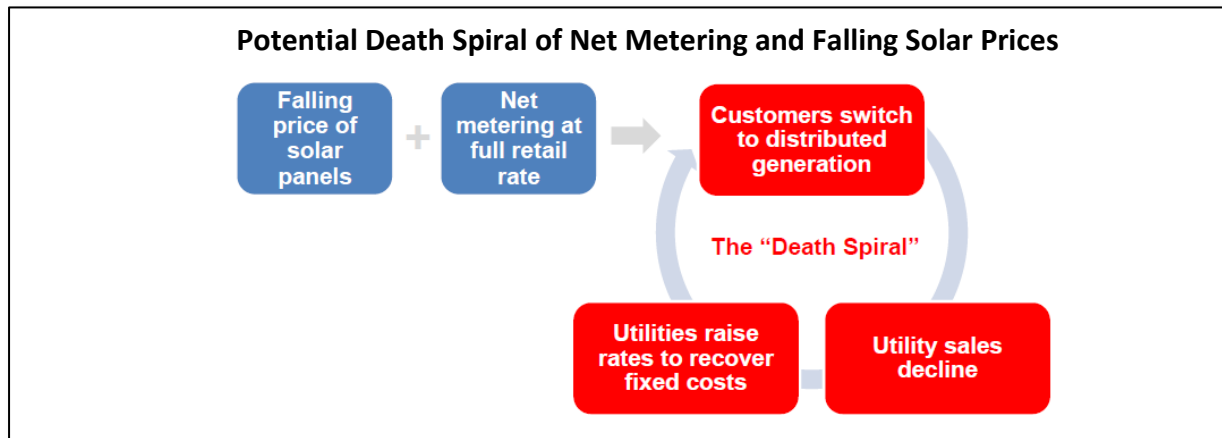
The system capacity limits adopted by Michigan's net metering program provide more than adequate capacity to accommodate future growth. The same MPSC report suggested the capacity left for additional net metering in category 1 (up to 20 kW) ranges from 77% to 99% at various utilities, with an average of 90% (detailed data can be found in Appendix III). DTE Energy, specifically, still has 91% capacity remaining for future net metering participants. Furthermore, only 78 DTE Energy customers, with 1,700 kW total capacity, are currently participating in the category 2 size range (20 kW – 150 kW), leaving 94% capacity for future category 2 participants.



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- 3. However, a key concern with net metering is the transfer of electric system costs from participating to non-participating ratepayers, resulting in unfair rate subsidization. This could lead to a “death spiral” if not managed carefully**

A key concern with net metering is the transfer of electric system costs from participating to non-participating ratepayers, described as a potential “death spiral” by the Brattle Group.³



Customers participating in net metering programs avoid the costs of transmission and distribution for their portion of the electric usage met by the distributed generation systems. Because these costs are fixed, they are shifted to the remaining ratepayers, resulting in higher electric rates. A subsidy or “cost shift” from non-participants to those participating in net metering thus occurs. Moreover, transmission and distribution costs comprise two-thirds of a typical customer's bill in Michigan. The cost shift could be substantial if participation in net metering programs were to increase significantly. This would be particularly disconcerting because participants in net metering programs are often more affluent than non-participants (given the still hefty price tags of distributed generation technologies such as solar), resulting in a subsidy from lower income to higher income customers.

³ The Brattle Group. (2012). California's Search for a Better Rate Design. www.brattle.com/documents/UploadLibrary/Upload1059.pdf. Accessed Feb 19, 2013

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4. Studies in other states show inconclusive results about the rate impacts of net metering. The potential economic impacts would need to be rigorously studied before any changes were made to Michigan's net metering program

A few studies have attempted to look at rate impacts of net metering, specifically whether a subsidy or "cost shift" from non-participants to those participating in net metering is occurring.

By comparing the findings from these studies, it appears to be inconclusive on whether net metering imposes a net benefit or a net cost to ratepayers. Even within the same state (e.g., California), results can be drastically different, possibly for reasons of study timing (the Energy and Environmental Economics study⁴ reflects 2010 market condition and rate structure) or bias (the Crossborder study⁵ is commissioned by the Vote Solar Initiative, a strong advocate of net metering).

Nonetheless, previous studies all suggest that the economic impacts of net metering on non-participating ratepayers are highly dependent on

- underlying electric rate design
- market condition (e.g., market power prices and capacity prices)
- generation profile of the net metered system (e.g., capacity factors and capacity value during peak hours)

Michigan, as with all states, has its unique electric rate structure, market condition and renewable generation profile. Therefore, it is critical for Michigan legislators and regulators to rigorously study the economic impacts of net metering on Michigan's ratepayers before any changes are made to the net metering program.

The following table summarizes the findings of studies performed in Vermont, New York, and California.

⁴ Energy and Environmental Economics, Inc. (2010). Net energy metering (NEM) cost effectiveness evaluation (E3 study). www.cpuc.ca.gov/PUC/energy/DistGen/nem_eval.htm. Accessed Feb 19, 2013

⁵ Crossborder Energy. (2013). Evaluating the Benefits and Costs of Net Energy Metering in California. <http://mseia.net/site/wp-content/uploads/2012/05/Crossborder-Energy-CA-Net-Metering-Cost-Benefit-Jan-2013-final.pdf>. Accessed Feb 19, 2013

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Studies on Rate Impacts of Net Metering

Study	Year	State	Findings
Vermont Public Service Department⁶	2012	Vermont	<p>Net metered systems <u>can be a net cost or net benefit</u> to ratepayers depending on distributed generation technology (wind or solar), greenhouse gas emission costs, market modeling and other financial assumptions. Generally,</p> <ul style="list-style-type: none"> ▪ Solar photovoltaic (PV) brings more benefits than wind due to its greater coincidence of generation with times of peak demand ▪ Wind power has net costs whether greenhouse gas emission costs are included or not
NYSERDA Solar Study⁷	2012	New York	<p>Net metering <u>represents a net cost</u> to the ratepayers who do not participate in the net metering program</p> <ul style="list-style-type: none"> ▪ The total amount of cost transfer grows from zero to \$325 million in 2025, peaks at \$380 million in 2038 and then tapers off as net metered systems begin to reach the end of their useful lives ▪ The major constraint to solar scale-up is that to reach the 5,000 MW goal, the loss in utility revenue from net metering ratepayers' loads could require "significant cross subsidies"
Energy and Environmental Economics (CPUC)⁸	2010	California	<ul style="list-style-type: none"> ▪ The 386 MW solar PV installed through 2008 will result in a <u>net present value cost</u> to ratepayers of approximately \$230 million over the next 20 years, or approximately \$20 million per year on an annualized basis. ▪ The average net cost of net metering (NEM) to non-NEM ratepayers is \$0.12 / kWh exported - relatively high on a cents per kWh basis
Crossborder on behalf of the Vote Solar Initiative⁹	2013	California	<ul style="list-style-type: none"> ▪ Net metering imposes a <u>net cost</u> of \$0.013 / kWh exported to PG&E's residential customers, but a net benefit of \$0.007 / kWh and \$0.028 / kWh exported to SCE and SDG&E residential customers when the 5% of net metering capacity limit is reached ▪ The economic impacts of net metering on non-participating ratepayers are highly dependent on the underlying electric rate design

⁶ Vermont Public Service Department. (2013). Evaluation of Net Metering in Vermont Conducted Pursuant to Act 125 of 2012. www.leg.state.vt.us/reports/2013ExternalReports/285580.pdf. Accessed Feb 19, 2013.

⁷ New York State Energy Research and Development Authority . (2012). New York Solar Study: An Analysis of the Benefits and Costs of Increasing Generation from Photovoltaic Devices in New York . www.nyserdera.ny.gov/Publications/Program-Planning-Status-and-Evaluation-Reports/Solar-Study.aspx. Accessed Feb 19, 2013

⁸ Energy and Environmental Economics, Inc. (2010). Net energy metering (NEM) cost effectiveness evaluation (E3 study). www.cpuc.ca.gov/PUC/energy/DistGen/nem_eval.htm. Accessed Feb 19, 2013

⁹ Crossborder Energy. (2013). Evaluating the Benefits and Costs of Net Energy Metering in California. <http://mseia.net/site/wp-content/uploads/2012/05/Crossborder-Energy-CA-Net-Metering-Cost-Benefit-Jan-2013-final.pdf>. Accessed Feb 19, 2013

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It is also important to note that there is no consistent approach adopted by the studies. For instance, studies in Vermont and New York considered the costs and benefits of the gross outputs from net metered systems while studies in California only considered the costs and benefits of the exported energy to the grid. Nonetheless, they generally tried to capture the following costs:

- Lost revenue to electric utility companies (due to participants paying smaller electric bills)
- Net metering-related administrative costs (engineering, billing, etc.)

And they generally captured the following benefits:

- Avoided energy costs
- Avoided capacity costs
- Avoided transmission and distribution line losses
- Avoided transmission and distribution investments and O&M costs
- Added environmental benefits such as avoided greenhouse gas emission costs

The studies differed in whether or how they considered the benefits related to

- Natural gas price hedging
- Avoided renewable purchases to meet RPS standards
- Additional reliability benefits

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Appendix I Summary of States' Net Metering Programs

State	System Capacity Limit	Aggregate Capacity Limit	Meter Aggregation
Alaska	25 kW	1.5% of average retail demand	Not addressed
Arizona	No capacity limit specified, but system must be sized to meet part or all of customer's electric load and may not exceed 125% of customer's total connected load	No limit specified	Not addressed
Arkansas	300 kW for non-residential; 25 kW for residential	No limit specified	Not addressed
California	1 MW 5 MW for systems operating under the bill credit transfer program authorized by Public Utilities Code 2830. System must be owned by, operated by, or on property under the control of, a local government or university	5% of aggregate customer peak demand (statewide limit of 500 MW for fuel cells)	Virtual net metering allowed for multi-tenant properties. Meter aggregation allowed for local governments if all participating accounts receive a time-of-use rate. Pending determination from the CPUC and ratemaking authorities of other utilities, meter aggregation may be allowed for all customers with multiple meters on parcels of land contiguous to the location of the renewable energy system. See below for more explanation.
Colorado	IOU customers: 120% of the customer's average annual consumption. Municipality and co-op customers: 25 kW for non-residential; 10 kW for residential	No limit specified	Allowed for IOU customers
Connecticut	2 MW	No limit specified	Yes (virtual net metering allowed for municipal customers)
Delaware	2 MW for non-residential Delmarva customers; 500 kW for non-residential DEC and municipal utility customers; 25 kW for all residential customers; 100 kW for all farm customers on residential rates subject to an appeal and case-by-case determination by Delaware Energy Office which may grant exceptions to this limitation in accordance with Title 26, section 1014(d)(1)b	5% of Electric Supplier's aggregated customer monthly peak demand (utilities may increase limit)	Allowed via a subscribers "sharing a unique set of interests" to community-owned system or and aggregation of a customer's multiple accounts, to allow net-metering systems to provide up to 110% of a customers' expected aggregate electricity consumption, extending net-metering to leased and third party owned systems, and for single or aggregation of a customer's multiple accounts, and extending net-metering to fuel cells as well as renewable energy fuel cells for community-owned systems
District of Columbia	1 MW	No limit specified	Not addressed
Florida	2 MW	No limit specified	Not allowed
Georgia	100 kW for non-residential; 10 kW for residential	0.2% of utility's peak demand during previous year	Not addressed
Hawaii	100 kW for HECO, MECO, HELCO customers; 50 kW for KIUC customers	15% per circuit distribution threshold for distributed generation penetration	Not addressed

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State	System Capacity Limit	Aggregate Capacity Limit	Meter Aggregation
Illinois	Current rules: 40 kW New rules per SB 1652/HB 3036: 2 MW	Current rules: 1% of utility's peak demand in previous year New rules per SB 1652/HB 3036: 5% of utility's peak demand in previous year	Allowed
Indiana	1 MW	1% of utility's most recent peak summer load	Not addressed
Iowa	500 kW	No limit specified	Not addressed
Kansas	200 kW for non-residential; 25 kW for residential	1% of utility's retail peak demand during previous year	Not addressed
Kentucky	30 kW	1% of utility's single-hour peak load during previous year	Not addressed
Louisiana	Commercial and agricultural: 300 kW Residential: 25 kW	0.50%	Not addressed
Maine	660 kW for IOU customers; 100 kW for muni and co-op customers (munis and co-ops may voluntarily offer net energy billing for systems up to 660 kW)	No limit specified	Allowed
Maryland	2 MW (30 kW for micro-CHP); also limited to that needed to meet 200% of baseline customer electricity usage	1,500 MW (~8% of peak demand)	Allowed for agricultural customers, non-profit organizations, and municipal governments or their affiliates
Massachusetts	10 MW for net metering by a municipality or other governmental entity; 2 MW for all other "Class III" systems; 1 MW for all other "Class II" systems; 60 kW for all other "Class I" systems	3% of utility's peak load for private entities; 3% of utility's peak load for municipalities or governmental entities	Neighborhood net metering allowed
Michigan	150 kW	0.75% of utility's peak load during previous year	Not addressed
Minnesota	Less than 40 kW	No limit specified	Not addressed
Missouri	100 kW	5% of utility's single-hour peak load during previous year	Not addressed
Montana	50 kW	No limit specified	Not addressed
Nebraska	25 kW	1% of utility's average monthly peak demand	Not addressed
Nevada	The lesser of 1 MW or 100% of the customer's annual requirements for electricity	Statewide cap of 2% of total peak capacity of all utilities in the state	Not addressed for most technologies. Meter aggregation allowed for hydro installations across contiguous properties owned by the customer generator. Meter aggregation allowed for very specific wind projects
New Hampshire	1 MW	50 MW	Not addressed
New Jersey	No capacity limit specified, but system must be sized so that energy production does not exceed customer's annual on-site energy consumption	No limit specified (Board of Public Utilities may limit to 2.5% of peak demand)	Permitted for public entity PV systems (implementing rules not yet in place)
New Mexico	80 MW	No limit specified	Not addressed

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State	System Capacity Limit	Aggregate Capacity Limit	Meter Aggregation
New York	Solar: 25 kW for residential; 2 MW for non-residential Wind: 25 kW for residential; 2 MW for non-residential; 500 kW for farm-based Micro-hydroelectric: 25 kW for residential; 2 MW for non-residential Fuel Cells: 10 kW for residential; 1.5 MW for non-residential Biogas: 1 MW (farm-based only) Micro-CHP: 10 kW (residential only)	Generally 1% of utility's 2005 demand for solar, farm-based biogas, fuel cells, micro-hydroelectric, and residential micro-CHP; 3% (36 MW) for Central Hudson Gas and Electric 0.3% of utility's 2005 demand for wind	Allowed for non-residential and farm-based customers with solar, wind, farm-based biogas, and micro-hydroelectric systems
North Carolina	1 MW	No limit specified	Not addressed
North Dakota	100 kW	No limit specified	Not addressed
Ohio	No capacity limit specified, but system must be sized primarily to offset part or all of customer's electricity requirements	No limit specified	Not addressed
Oklahoma	100 kW or 25,000 kWh/year (whichever is less)	No limit specified	Not addressed
Oregon	2 MW for non-residential & 25 kW for residential PGE and PacifiCorp customers; 25 kW for muni, co-op and PUD customers	No limit specified for PGE and PacifiCorp; 0.5% of utility's historic single-hour peak load for munis, co-ops, PUDs	Allowed
Pennsylvania	5 MW for micro-grid and emergency systems; 3 MW for non-residential; 50 kW for residential	No limit specified	Virtual meter aggregation allowed
Rhode Island	5 MW (systems must be "reasonably designed" to generate only up to 100% of annual electricity consumption)	3% of peak load (2 MW reserved for systems under 50 kW)	Allowed
Utah	2 MW for non-residential; 25 kW for residential	20% of 2007 peak demand for Rocky Mountain Power; 0.1% of utility's 2007 peak demand for co-ops	Allowed at same or adjacent location
Vermont	2.2 MW for military systems; 20 kW for micro-CHP; 500 kW for all other systems	4% of utility's 1996 peak demand or peak demand during most recent calendar year (whichever is greater).	Group net metering allowed
Virginia	500 kW for non-residential; 20 kW for residential	1% of utility's adjusted Virginia peak-load forecast for the previous year	Not addressed
Washington	100 kW	0.25% of utility's 1996 peak demand (increases to 0.5% on 1/1/2014)	Allowed
West Virginia	IOUs with more than 30,000 customers: 2 MW for industrial; 500 kW for commercial; 25 kW for residential. IOUs with fewer than 30,000 customers, municipal utilities and co-ops: 50 kW for commercial and industrial; 25 kW for residential.	3% of peak demand during the previous year	Allowed
Wisconsin	20 kW (some utilities allow net metering for systems up to 100 kW)	No limit specified	Not addressed
Wyoming	25 kW	No limit specified	Not addressed

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Appendix II Michigan Net Metering Program Participation

Table 2: PA 295 Program Size and Net Metering Participation
For Category 1: 20 kW and Under &
Category 2: Greater Than 20 kW - 150 kW Installations

Company	Category 1 Participation (No. of Customers)	Category 1 Nameplate Generation (kW)	Category 2 Participation (No. of Customers)	Category 2 Nameplate Generation (kW)
Alger Delta	13	39		
Alpena	19	54		
Cherryland	23	64		
Cloverland	28	87		
Consumers Energy	153	652		
Detroit Edison	585	4,483	4	128
Direct Energy	1	3		
Great Lakes Energy	42	173		
Homeworks Tri-County	8	29		
Indiana Michigan (AEP)	24	96		
Midwest	16	55		
Ontonagon	14	49		
Presque Isle	19	51		
Thumb	5	11		
Uppco	38	118		
We Energies	16	56		
WPSC	6	16		
Xcel	1	2		
Total	1,011	6,038	4	128
Source: 2011 Net Metering Reports Case U-15787				

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Append III Michigan Net Metering Program Capacity Remaining

Table 3: PA 295 Net Metering Program Capacity
Category 1: 20 kW and Under

Company	No. of Customers	2010 In-State Peak Load (MW)	Cap 0.5% of 2009 Peak (kW)	Current Nameplate Generation (kW)	Space Remaining (kW)
Investor Owned Utilities					
Alpena	19	57	285	54	231
Consumers Energy	153	7,635	38,175	652	37,523
Detroit Edison	585	10,497	52,485	4,483	48,002
Indiana Michigan	24	905	4,525	96	4,429
Uppco	38	102	510	118	392
We Energies	16	341	1,705	56	1,649
WPSC	6	22	110	16	94
Xcel	1	30	150	2	148
Cooperative Utilities					
Alger Delta	13	-	-	39	-
Cherryland	23	-	-	64	-
Cloverland	28	147	735	87	648
Great Lakes	42	-	-	173	-
Midwest	16	139	695	55	640
Ontonagon	14	6	30	49	-
Presque Isle	19	47	235	51	183
Thumb	5	35	175	11	164
Tri County	8	-	-	29	-
Alternative Electric Suppliers					
Direct Energy	1			3	
TOTAL	1,011			6,038	
Alger Delta, Cherryland, Great Lakes and Tri-County are member-regulated cooperatives and are not required to offer net metering. Source: 2011 Utility Annual Net Metering Reports.					